

**Installation  
Guide**

# hp StorageWorks SAN Switch 2/16 Version 3.1.2

Fourth Edition (May 2004)

**Part Number:** AA-RR84D-TE

This installation guide provides basic procedures for setting up, configuring, and managing the SAN Switch 2/16 and SAN Switch 2/16 power pack models.



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SAN Switch 2/16 Version 3.1.2 Installation Guide

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## about this guide

This installation guide provides information to help you set up and configure the HP StorageWorks SAN Switch 2/16. This preface discusses the following topics:

- [Audience](#), page 8
- [Related Documentation](#), page 8
- [Conventions](#), page 8
- [Rack Stability](#), page 11
- [Getting Help](#), page 11

## Audience

This installation guide is intended for use by customers who purchased the SAN Switch 2/16 or SAN Switch 2/16 power pack; and for authorized service providers who are experienced with the following:

- Configuration aspects of customer Storage Area Network (SAN) fabrics
- Customer host environments, such as Windows 2000®, Windows NT®, and IBM AIX
- Web Tools Graphical User Interface (GUI), for configuring the switch via a supported Web browser

## Related Documentation

For a list of related documents included with this product, see the Related Documents section of the *HP StorageWorks SAN Switch 2/16 Version 3.1.2 Release Notes*.

For the latest information, documentation and firmware releases, please visit the following HP StorageWorks website:

<http://www.hp.com/country/us/eng/prodserv/storage.html>

For information about Fibre Channel standards, visit the Fibre Channel Association web site, located at:

<http://www.fibrechannel.org>

## Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Equipment Symbols](#)



## Document Conventions

The document conventions are specified in [Table 1](#) apply in most cases.

**Table 1: Document Conventions**

Element	Convention
Cross-reference links	Blue text: <a href="#">Figure 1</a>
Key and field names, menu items, buttons, and dialog box titles	<b>Bold</b>
File names, application names, and text emphasis	<i>Italics</i>
User input, command and directory names, and system responses (output and messages)	Monospace font COMMAND NAMES are uppercase monospace font unless they are case sensitive
Variables	<monospace, italic font>
Website addresses	Blue, underlined sans serif font text, for example: <a href="http://www.hp.com">http://www.hp.com</a>

## Text Symbols

The following symbols may be found in the text of this guide.



**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



**Caution:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

**Note:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

## Equipment Symbols

The following equipment symbols may be found on hardware discussed in this document:



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

**WARNING:** To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.

---



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

**WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

---



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

**WARNING:** To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.

---



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

**WARNING:** To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

---



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

---

## Rack Stability

Rack stability protects personnel and equipment.



**WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
  - The full weight of the rack rests on the leveling jacks.
  - In single rack installations, the stabilizing feet are attached to the rack.
  - In multiple rack installations, the racks are coupled.
  - Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.
- 

## Getting Help

If you have any questions after reading this guide, contact an HP authorized service provider or go to our website at: <http://www.hp.com>.

## HP Technical Support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

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**Note:** For continuous quality improvement, calls may be recorded or monitored.

---

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support: <http://www.hp.com/support/>

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

## HP Storage Website

The HP storage website has the latest information on this product. Access storage at: <http://thenew.hp.com/country/us/eng/prodserv/storage.html>. From this website, select the appropriate product or solution.

## HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the HP website for locations and telephone numbers:  
<http://www.hp.com>

# Overview



The HP StorageWorks SAN Switch 2/16 is a high-performance, 16-port, 2 gigabit (Gb) Fibre Channel (FC) switch that interconnects storage devices, hosts, and servers in a SAN.

The HP StorageWorks SAN Switch 2/16 is offered in two configurations: the 2/16 and 2/16 power pack. Refer to the *HP StorageWorks SAN Switch 2/16 Fabric OS 3.1.2 Release Notes* for a complete list of management features enabled on your switch.

---

**Note:** This guide refers to both models as the SAN Switch 2/16, unless otherwise noted.

---

This chapter provides the following information:

- [SAN Switch 2/16 Features](#), page 14
- [Firmware](#), page 14
- [Hardware](#), page 15

## SAN Switch 2/16 Features

Read the following sections for feature-specific information.

### Firmware

The SAN Switch 2/16 operates using Fabric Operating System (FOS) firmware Version 3.1.2. (version as of this writing, please refer to the switch Release Notes for exact version number). The firmware supports:

- An optional Security feature that provides security mechanisms at all vulnerable points in a SAN fabric, from hosts to storage at the port, switch, and fabric levels
- High-speed data traffic using Interswitch Link (ISL) trunking technology.
- Automatic rerouting through the Fabric Shortest Path First (FSPF) algorithm.
- Application Programming Interface (API), a protocol that allows applications to interface with switch services.
- Zoning, which provides a means to allocate storage controllers to groups of computers. Zoning allows you to create logical subsets of the fabric to accommodate closed user groups or to create functional user groups within a fabric.

For more information refer to the *HP StorageWorks Zoning Version 3.1.x/4.1.x User Guide*.

- Per port statistics to help technicians diagnose and isolate problem ports without disrupting switch operations.
- Error detection and fault isolation, which automatically disables failing ports and restarts when the problem is resolved.
- Industry standard Management Information Base (MIB).
- Automatic self-discovery, which discovers and registers host server and storage devices.

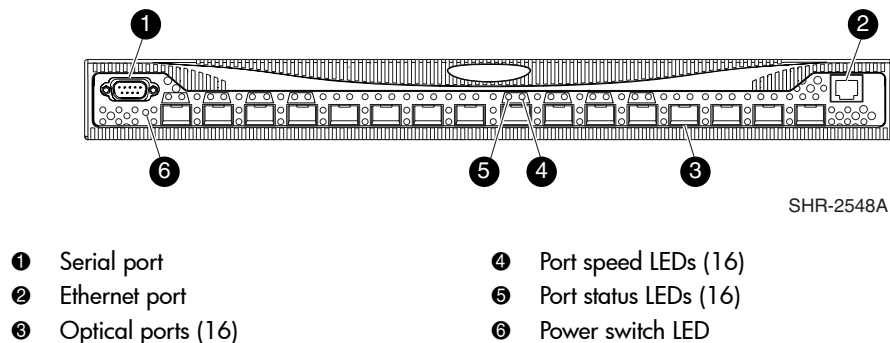
## Hardware

The SAN Switch 2/16 consists of the following components:

- A 1-Unit (U) chassis, designed for mounting in a 19-inch rack, with forced-air cooling that flows from the back of the switch to the front.
- 16 optical ports, compatible with Small Form Factor Pluggable (SFP) media.
- One RS-232 Serial port (DB9 connector) on the front panel.
- One IEEE compliant RJ-45 connector on the front panel for use with 10/100 Mbps Ethernet or in-band.
- The following LEDs:
  - One Power Switch LED on the left of the front panel
  - One Port Status and Port Speed LED for each of the 16 ports
  - One Power Supply LED on the back of the power supply
  - One Port Readiness LED on the back panel
- Universal input power supplies with AC switches and built-in fans. (The power supplies plug into internal blind-mate connectors when installed in the chassis.)
- Two fan trays, each containing two fans. Air is pulled in through the rear intake and pushed out through the vents in the front panel. The fans provide adequate cooling for the maximum switch power rating.
- Three digital thermometers, capable of sensing a temperature range from -55°C to +125°C, in 0.5°C increments
- A field-replaceable motherboard completely enclosed in an Electro-Magnetic Interference (EMI) enclosure tray, with logic and chassis ground connected to the chassis, and an embedded processor that processes frames up to 1024 bytes.
- A real-time clock (RTC) with a 10-year battery and 56 bytes of NVRAM.

## SFP Media Side

The front panel of the SAN Switch 2/16 is shown in [Figure 1](#). The front panel houses the Serial port, Ethernet port, fiber optic ports with corresponding LEDs, and the power switch LED.



**Figure 1: SFP media side**

## Optical Ports

All switch ports support full fabric capability. Full fabric allows the Fibre Channel SAN Switch 2/16 to link or cascade to other HP StorageWorks Fibre Channel switches running v2.6x and later, building a highly scalable SAN fabric. The Fibre Channel SAN Switch 2/16 supports F\_port, FL\_port, and E\_port connections and Distributed Name Server (DNS).

The ports on the front panel of the SAN Switch 2/16 are color-coded in groups, with four purple ports alternating with four unmarked ports, to indicate which ports can be used in the same ISL trunking group (see [“ISL Trunking”](#) on page 17). Each port automatically negotiates to the highest common speed.

The ports are capable of operating at 2.125 Gbps or 1.0625 Gbps. Each port conforms to the American National Standards Institute (ANSI) Fibre Channel, FC-PI specification for Fibre Channel SFP transceivers.



## ISL Trunking

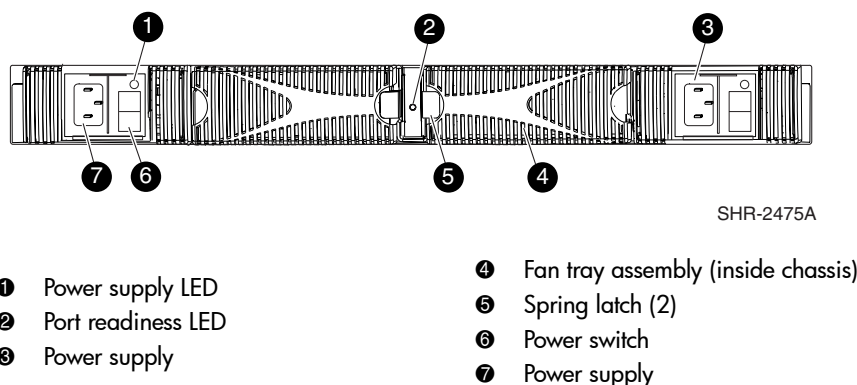
ISL trunking is a Fabric OS feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For specific information about ISL trunking, refer to the *HP StorageWorks Trunking Version 3.1.x/4.1.x User Guide*.

## SFPs

The ports connect to SFP media. SFPs are universal and self-configuring.

## Power Supply Side

**Figure 2** shows the rear panel of the switch. The rear panel houses the fan trays, power supplies, and switch status LED. Each power supply also integrates a separate status LED. The power supplies, fan trays, and motherboard are all Field Replaceable Units (FRUs).



**Figure 2: Power supply side**

## Field-Replaceable Units

The power supplies, fan trays, and motherboard can all be replaced in the field, without the use of special tools. The switch continues operating during the replacement of a fan tray or power supply, if they are replaced one at a time. The switch must be turned off during replacement of the motherboard. To simplify replacement, the switch has a minimum of internal cables and no jumpers or hardware settings. Replacement instructions are provided with all replacement units ordered.

## Optional Hardware Kits

HP provides the following optional hardware kits in support of the SAN Switch 2/16, see [Table 2](#).

**Table 2: SAN Switch 2/16 Orderable Hardware**

Accessory	Part Number
Short wavelength SFP	A6515A* or 300834-B21**
Long wavelength SFP, 10 km	A6516A* or 300835-B21**
2m LC-to-LC Fibre Channel (fc) cable	C7524A*
2m LC-to-LC multi-mode fc cable	221692-B21**
16m LC-to-LC fc cable	C7525A*
5m LC-to-LC multi-mode fc cable	221692-B22**
50m LC-to-LC fc cable	C7526A*
15m LC-to-LC multi-mode fc cable	221692-B23**
200m LC-to-LC fc cable	C7527A*
30m LC-to-LC multi-mode fc cable	221692-B26**
50m LC-to-LC multi-mode fc cable	221692-B27**
2m LC-to-SC fc cable	C7529A*
2m LC-to-SC multi-mode fc cable	221691-B21**
16m LC-to-SC fc cable	C7530A*
5m LC-to-SC multi-mode fc cable	221691-B21**
15m LC-to-SC multi-mode fc cable	221691-B23**
30m LC-to-SC multi-mode fc cable	221691-B26**
50m LC-to-SC multi-mode fc cable	221691-B27**
SC female to SC female adapter	C7534A*
2m LC male to SC male adapter kit	C7534A*

\* Pre-merger HP part number

\*\* Pre-merger Compaq part number

# Installing the SAN Switch 2/16

## 2

This chapter covers the following topics:

- [Unpack and Verify Carton Contents](#), page 20
- [Installation Guidelines](#), page 23
- [Installing the SAN Switch as a Stand-alone Unit](#), page 25
- [Connecting AC Power](#), page 37
- [Configuring Network Addressing](#), page 39
- [Connecting the Switch to the LAN](#), page 43
- [Important Information on Setting the Core PID Format](#), page 44
- [Modifying Domain IDs](#), page 46
- [Specifying Custom Status Policies](#), page 47
- [Connecting the Switch to the Fabric](#), page 47
- [Installing Multiple Switches into an Existing SAN](#), page 49
- [Next Steps](#), page 50

## Unpack and Verify Carton Contents

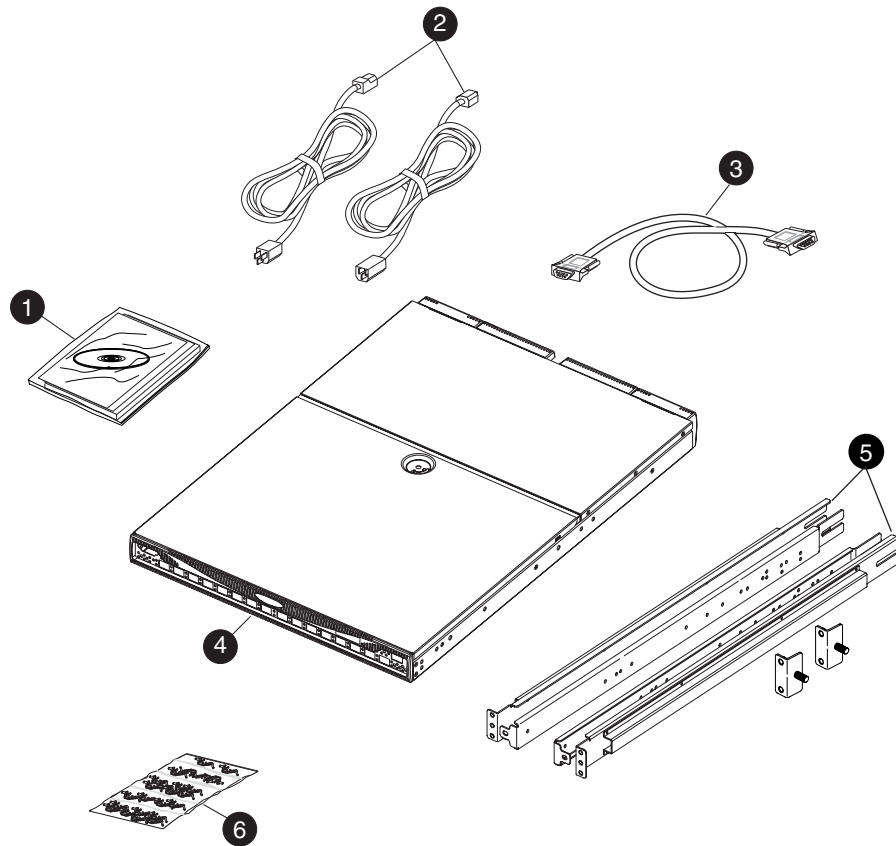
Unpack and inspect the SAN Switch 2/16 carton contents as follows.

1. Inspect the shipping container for possible damage caused during transit.
2. Unpack the shipping cartons.

---

**Note:** The Rack Mount Kit shown in [Figure 3](#) and [Table 3](#) may not represent the kit that shipped with your switch. HP reserves the right to substitute Rack Mount Kits, providing applicable instructions with each switch.

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SHR-2489B

**Figure 3: Carton contents**

**Table 3: Shipping Carton Contents**

Item Number	Description
①	One HP StorageWorks SAN Switch 2/16 product accessory bag containing CD, license, documentation
②	Two standard AC power cords and two PDU cords
③	One RS-232 Serial cable (convertible to an RJ-45 connector, by removing the adapter on the end of the cable)
④	HP StorageWorks SAN Switch 2/16
⑤	<b><u>SAN Switch Rack Mount Kit (PN 331148-B21):</u></b> <ul style="list-style-type: none"> <li>• Two rear mounting brackets</li> <li>• A right inner rail and a right outer rail</li> <li>• A left inner rail and a left outer rail</li> </ul>
⑥	<b><u>Pouch containing Rack Mount hardware:</u></b> <ul style="list-style-type: none"> <li>• (14) #8-32 x 3/16-inch Phillips pan-head screw with thread lock for the SAN Switch 2/32</li> <li>• (14) 8-32 x 5/16-inch Phillips pan-head SEMS screw for use with the SAN Switch 2/8, SAN Switch 2/8V, SAN Switch 2/16, SAN Switch 2/16V, and SAN Switch 2/16N</li> </ul> <hr/> <b>Note:</b> 8-32 x 5/16-inch Phillips pan-head SEMS screw graphic is not available for this release. <hr/> <ul style="list-style-type: none"> <li>• (10) #10-32 x 1/2-inch Phillips pan-head screw with captive star lock washer</li> <li>• (8) #10 alignment washer</li> <li>• (8) #10 adapter washer</li> <li>• (2) 1/4-20 hex nut with captive star lock washer</li> <li>• (2) 1/4-inch flat washer</li> </ul>

## Installation Guidelines

Read the following sections for installation guidelines. Install the SAN Switch 2/16 in one of the following ways:

- As a stand-alone unit on a flat surface. For instructions, see [Installing the SAN Switch as a Stand-alone Unit](#), page 25.
- In the HP 9000 Series (or comparable) Rack using the SAN Switch Rack Mount Kit supplied with the switch, contents as outlined in [Table 3](#). For instructions, see [Installing the Switch in a Rack Using the SAN Switch Rack Mount Kit](#), page 26.

## Selecting an Operating Location

To ensure correct operation of the switch, the location where the switch is to be used must meet the following requirements:

- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.
- An air flow of at least 300 cubic feet per minute, available in the immediate vicinity of the switch.
- If installing the switch in the HP 9000 Series, HP System/e or comparable Electronics Industries Association (EIA) rack:
  - All equipment installed in the rack should have a reliable branch circuit ground connection, and should not rely on a connection to a branch circuit, such as a power strip.
  - The rack should be balanced and the installed equipment should be within the rack's weight limits. The rack must be mechanically secured to ensure stability in the event of an earthquake.

## Cooling Requirements

Cooling air is drawn into the switch chassis by the fans mounted on the rear of the chassis. The air is expelled through vents in the front of the chassis (the port/cable side). HP cautions that you must install the switch so that air intake and exhaust for all components in the rack flow in the same direction.



**Caution:** Do not block air vents. The switch uses ambient air for cooling.

---

## Power Requirements

Two AC power cords connect to the switch on either side of the rear panel. The AC power source must have the following:

- A properly wired, earth-grounded AC outlet
- Voltage capability of 85–264 VAC
- Input voltage frequency of 47–63 Hz
- Power capability of 75 watts, maximum

The switch has a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply is auto ranging in terms of accommodating input voltages and line frequencies.

## Electrostatic Discharge Precautions

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.



## Installing the SAN Switch as a Stand-alone Unit

Use the following procedures to set up the switch as a stand-alone unit. The following items are required for this setup:

- SAN Switch 2/16
  - AC power cords and cables supplied with the switch
  - Rubber mounting feet supplied with the switch
1. Place the SAN Switch 2/16 on a flat, sturdy surface like a table or lab bench.
  2. Apply the rubber feet as follows.
    - a. Clean the four depressions that are at each corner of the bottom of the switch to ensure they are free of dust.
    - b. Place a rubber foot in each depression, with the adhesive side against the chassis, and press into place.



**Caution:** HP recommends that you install the rubber feet on the switch to help prevent the switch from accidentally sliding off the table or bench.

---

3. Connect the power cable to the SAN Switch 2/16 power supply and to a power outlet. Ensure the power cable is routed so that it is not exposed to stress.
4. Turn on the power to the switch (flip the AC switch to 1). The switch automatically runs a Power-On Self-Test (POST).
5. If the SAN Switch 2/16 includes a second power supply, repeat steps 3 through 4 for the second power supply.

---

**Note:** Do not connect the switch to the network until the IP address is correctly set. For instructions on how to set the IP address, see [“Configuring Network Addressing”](#) on page 39.

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## Installing the Switch in a Rack Using the SAN Switch Rack Mount Kit

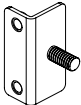

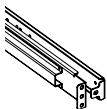
This section provides instructions for installing the switch in an HP System/e cabinet, or in an HP 10000 series cabinet using the HP StorageWorks SAN Switch Rack Mount Kit supplied with your switch. The Rack Mount Kit installation requires one technician to install a SAN Switch.

The following items are required to install the switch in a cabinet:

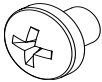
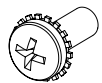


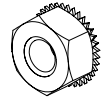

- SAN Switch 2/16
- Power cables
- #2 Phillips screwdriver
- 7/16-inch wrench or socket

The SAN Switch Rack Mount Kit rails and rail mounting hardware are shown in [Table 4](#):

**Table 4: SAN Switch Rack Mount Kit rails and rail mounting hardware**

Item	Description
	(2) Rear mounting bracket
	A right inner rail and a right outer rail
	A left inner rail and a left outer rail

**Table 4: SAN Switch Rack Mount Kit rails and rail mounting hardware (Continued)**

Item	Description
	<p>(14) #8-32 x 3/16-inch Phillips pan-head screw with thread lock for the SAN Switch 2/32</p> <p>(14) 8-32 x 5/16-inch Phillips pan-head SEMS screw for use with the SAN Switch 2/16.</p> <hr/> <p><b>Note:</b> 8-32 x 5/16-inch Phillips pan-head SEMS screw graphic is not available for this release.</p> <hr/>
	<p>(10) #10-32 x 1/2-inch Phillips pan-head screw with captive star lock washer</p>
	<p>(8) #10 alignment washer</p>
	<p>(8) #10 adapter washer</p>
	<p>(2) 1/4-20 hex nut with captive star lock washer</p>
	<p>(2) 1/4-inch flat washer</p>

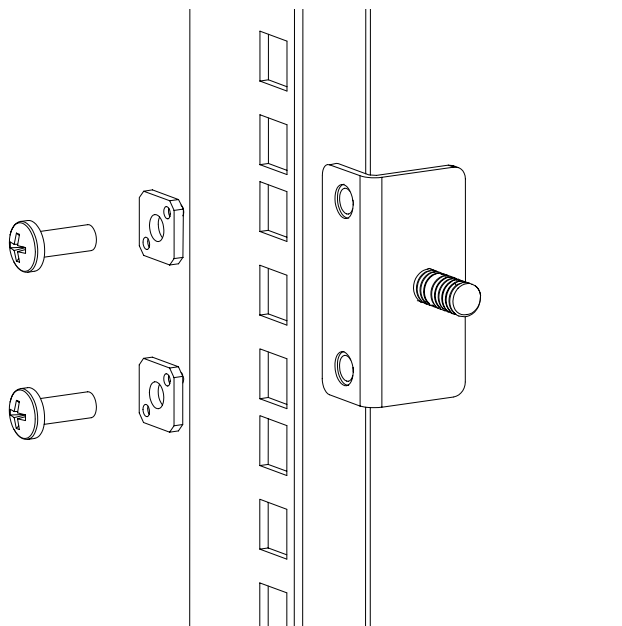


**Caution:** For proper air flow, the SFP media side of the SAN Switch 2/16 must face the rear of the rack. This mounting allows air to enter from the front of the rack and to exhaust at the rear of the rack, similar to other rack-mounted equipment. This prevents switch overheating, which may cause it to fail.

---

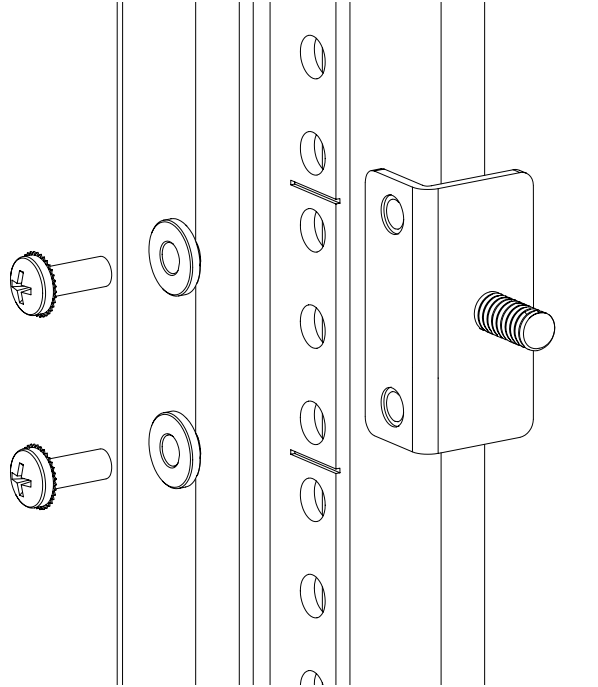
To install the switch in a rack:

1. Check the contents of the shipping carton to verify that all of the required parts and hardware are available.
2. Choose a mounting location in the rack.
3. Attach the rear mounting brackets to the rear rack uprights by completing one of the following steps:
  - For an HP 10000 series or comparable EIA cabinet, assemble each of the two brackets with two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers as shown in [Figure 4](#).



**Figure 4: Installing the rear mounting brackets (HP 10000 series or comparable EIA cabinet)**

- For an HP System/e rack, install each of the two rear mounting brackets with two #10-32 x 1/2-inch Phillips pan-head screws and two #10 alignment washers as shown in [Figure 5](#).

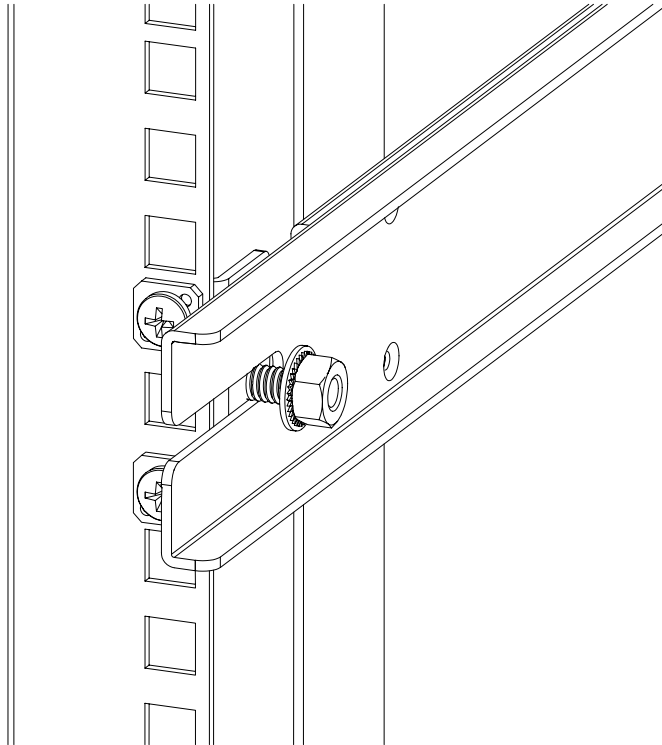


**Figure 5: Installing the rear mounting brackets (HP System/e rack-left rear upright)**

**Note:** This kit contains both left rails and right rails. The rails are marked as left and right.

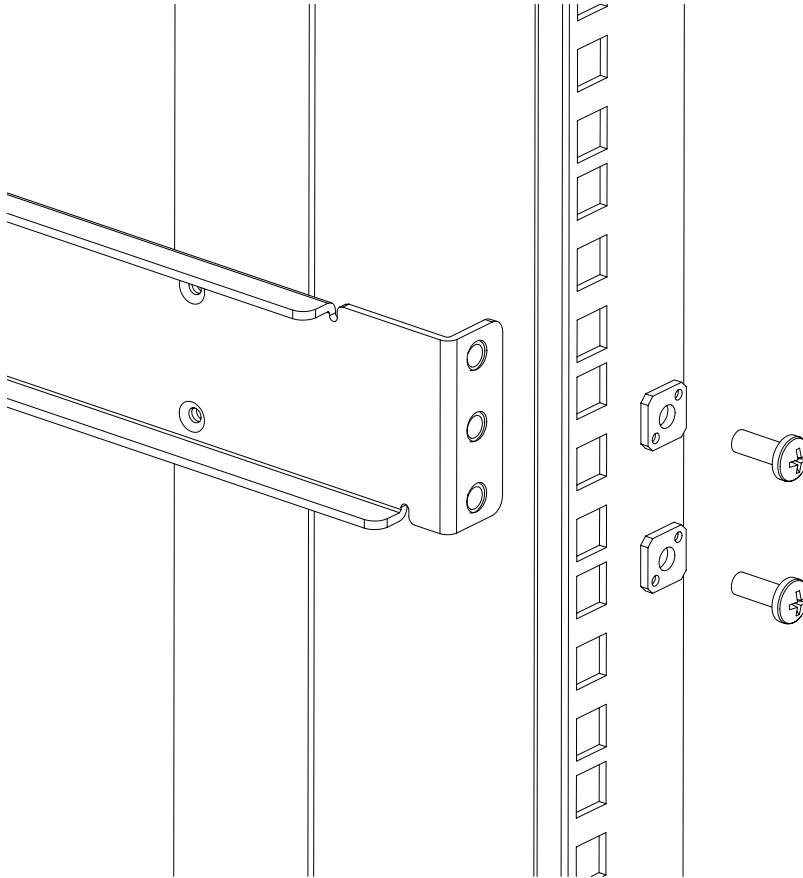
4. Assemble the outer rails by completing the following steps:

- a. Attach the left outer rail and the right outer rails to the rear mounting brackets using two 1/4-20 hex nuts with captive star lock washers attached loosely as shown in [Figure 6](#). Do not tighten the hex nuts; they will be tightened later in [step 8](#) on page 36.



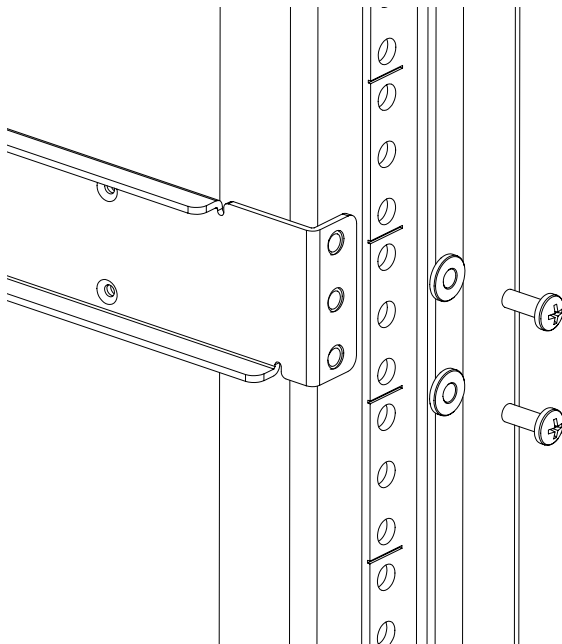
**Figure 6: Installing the outer rails (HP 10000 series or comparable EIA cabinet)**

- b. Depending on the rack you are using, complete one of the following tasks:
- For an HP 10000 series or comparable EIA cabinet, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the left rail. See [Figure 7](#).



**Figure 7: Assembling the outer rails (HP 10000 series or comparable EIA cabinet)**

- For an HP System/e cabinet, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the left rail. See [Figure 8](#).



**Figure 8: Assembling the outer rails (HP System/e cabinet)**



**Caution:** Do not use screws other than those provided. Use of any longer screws can cause damage to internal components.



---

**Note:** The mounting holes in the inner rails are marked 32, 16, and 8. When mounting the SAN Switch 2/16, use the mounting holes labelled 16 to install the inner rails on the switch.

When viewing a rack from the front, the left rails are used on the left side of the rack and the right rails are used on the right side of the rack. The rails must match up—right inner with right outer and left inner with left outer. Note that the SAN Switch mounts in the rack with its front, the port side, facing the back of the rack. The rear of the switch, the AC side, faces the front of the rack.

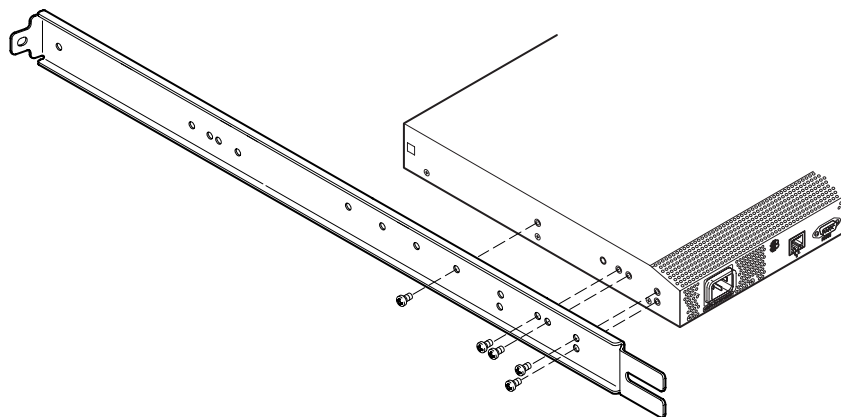
---

5. Assemble the two inner rails (one on each side) to the switch using ten of the #8-32 x 5/16-inch Phillips pan-head SEMS screws as shown in [Figure 9](#).

---

**Note:** The rail kit provides fourteen #8-32 x 5/16-inch screws for assembling the inner rails. Each switch requires a different number of these screws. For example, [Figure 9](#) shows an inner rail being attached to the SAN Switch 2/16 with five screws. Attaching both inner rails requires ten screws.

---



0012a

**Figure 9: Assembling the inner rails**

---

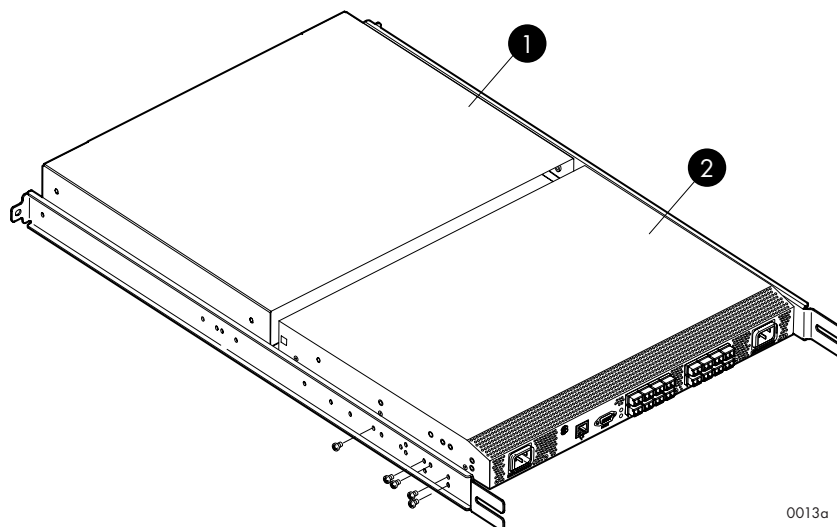
**Note:** For factory integration only, tighten the #8-32 x 5/16-inch Phillips pan-head screw with thread lock and torque between 6 to 8 inch-pounds.

---

---

**Note:** The plenum is a required part of this installation when the SAN switch 2/16 is installed in an HP 9000 or 10000 series, System/e or comparable EIA cabinet. The plenum allows air to dissipate at the rear of the rack, preventing overheating.

---



**Figure 10: Assembling the inner rails on a SAN Switch with plenum**

The components in [Figure 10](#) include:

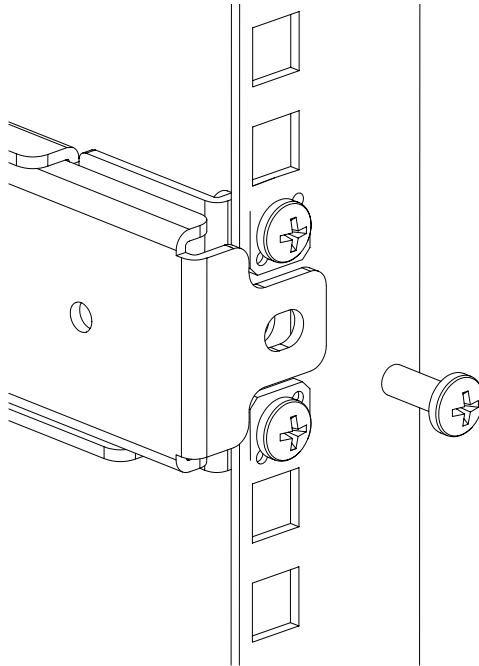
①	Plenum
②	Switch

6. Insert the switch with the attached inner rails into the outer rails.

---

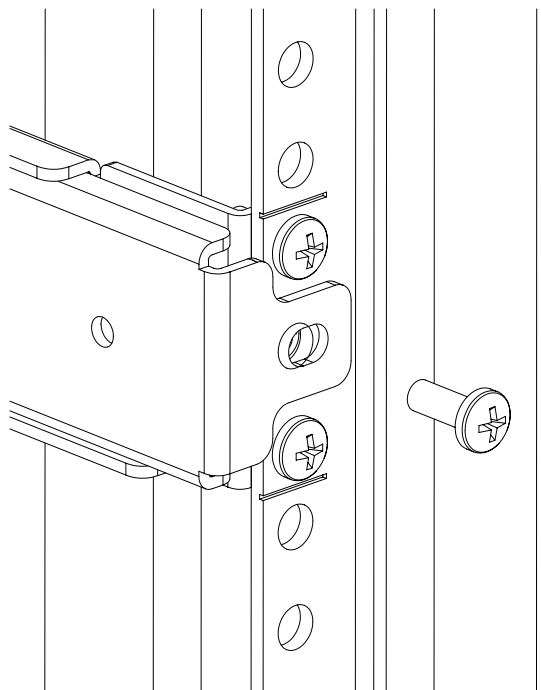
**Note:** This step applies to both the HP 10000 series, System/e cabinet or comparable EIA cabinets.

---



**Figure 11: Installing the switch into a rack (HP 10000 series or comparable EIA cabinet)**

7. Insert the switch into the rack and install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers, one on each side. See [Figure 11](#) and [Figure 12](#).



**Figure 12: Installing the switch into a rack (HP System/e cabinet)**

8. Tighten the nuts installed in [step a](#) of [step 4](#) on page 30. See [Figure 6](#) on page 30.

---

**Note:** To uninstall a switch, remove the middle #10-32 x 1/2-inch Phillips pan head screw with captive star lock washer from either side of the rack uprights.

---

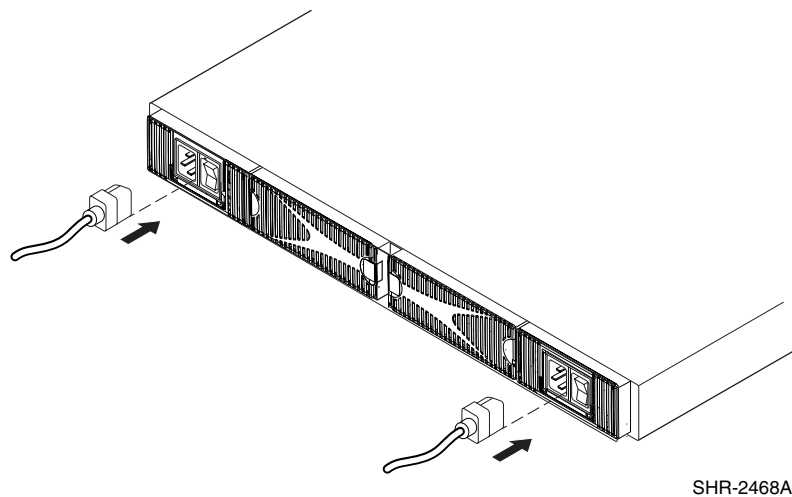
## Connecting AC Power

Use these steps to power on the SAN Switch 2/16.



**Caution:** Do not plug the power cords into the power source until the switch is completely installed in the rack.

1. Connect the switch power cords to the power connectors on the switch, see [Figure 13](#).



**Figure 13: Connecting the power cords**

2. Attach the other end of the power cord to a power outlet.
3. Turn on the Power Switch (the 1 position indicates power on, the O position indicates power off). The switch automatically runs POST.



**Caution:** Do not connect the switch to the network until the IP address is correctly set. For instructions on setting the IP address, see [“Configuring Network Addressing,”](#) on page 39.

## Power-On Self Test

Each time the switch is powered on, rebooted, or reset, the switch automatically runs a Power-On Self Test (POST). During POST the port status LEDs flash, verifying that the switch is operating properly. POST completes in approximately six minutes, with total boot time approximately seven minutes.

POST runs through the following test cycles:

- Preliminary POST diagnostics
- Initialization of operating system
- Initialization of hardware
- Diagnostic tests on circuitry, port functionality, memory, parity, statistics counters, and serialization

For example, if the switch prompt does not display when POST completes, POST was unsuccessful. Contact your authorized HP switch supplier for more information.

To determine whether POST completed without errors, verify that all LEDs return to a normal state after POST is complete. If one or more LEDs do not return to a normal state, (and this is not due to the switch being set to beacon), see [“Interpreting LED Activity”](#) on page 54 in Chapter 3.

---

**Note:** For more information about beaconing, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1x Procedures User Guide*.

---

## Checking POST Results

Check the success/fail results of the diagnostic tests run during POST via LED activity, the error log, or Command Line Interface (CLI) using the `errShow` command. For more information about error messages, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.

## Configuring Network Addressing

This section explains how to configure addressing for the switch.

### Requirements

The following items are required to set network addressing.

- An IP address from your network administrator
- The switch installed and connected to a power source
- Serial cable (supplied with the switch) for connecting the switch to the workstation
- A local workstation (desktop or notebook computer) with:
  - Microsoft® Windows 98, Windows® 2000, Windows Millennium Edition, or Windows NT® 4.0 operating system
  - RS-232 Serial communication software (for example, ProComm Plus or HyperTerminal)
- Ethernet cable for connecting the switch to the workstation or to a network containing the workstation
- SFPs and cables, as required to connect the switch to the fabric

## Setting Network Addresses via a Serial Connection

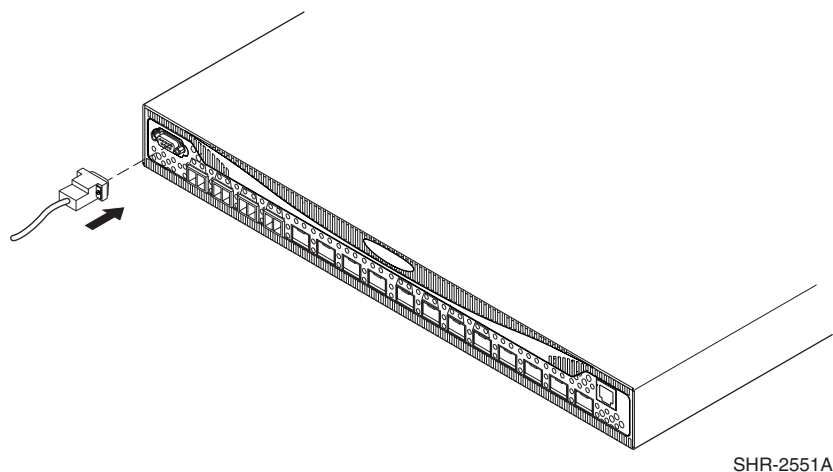
Use the following procedure to verify or change the switch IP address, subnetmask, or gateway address.

---

**Note:** During first-time setup, you must replace the factory IP, subnetmask, and gateway addresses with addresses provided by your network administrator.

---

1. Remove the shipping plug from the Serial port.
2. Connect the Serial cable to the Serial port, see [Figure 14](#).



**Figure 14: Connecting the Serial cable**

3. Connect the other end of the Serial cable to an RS-232 Serial port on the workstation. If no RS-232 Serial port is available on the workstation, the adapter on the end of the Serial cable can be removed to use the RJ-45 connector to create a Serial connection.
4. Verify that the switch power is on and POST is completed. See the “[Power-On Self Test](#)” on page 38.
5. Power on the workstation and establish a connection to the switch using a terminal emulator application (such as HyperTerminal).



**Note:** These steps show instructions specific to HyperTerminal. If you are using a different application, consult that application's documentation.

---

6. Using HyperTerminal (or similar application), configure the Port Settings as follows:

- Bits per second: 9600
- Databits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

To configure Port Settings in a UNIX® environment, enter:

```
tip /dev/ttyb -9600
```

7. Log in to the switch (with administrator privileges). The default administrator logon is `admin` and the default password is `password`.

- a. Enter the following at the prompt:

```
ipAddrSet
```

- b. Enter the following information at the corresponding prompts listed below:

- Ethernet IP Address [10.77.77.77]:  
Enter the new Ethernet IP address.
- Ethernet subnetmask [0.0.0.0]:  
Enter the new Ethernet subnetmask.
- Fibre Channel IP Address [none]:  
Enter the new Fibre Channel IP address if desired.
- Fibre Channel Subnetmask [none]:  
Enter the new Fibre Channel subnetmask if desired.
- Gateway Address [172.17.1.1]:  
Enter the new gateway address.
- Set IP address now? [y = set now, n = next reboot]:  
Enter y to set now.

- c. To verify that the IP address was entered correctly, enter:  
`ipAddrShow`
- d. After the IP address is verified as correct, remove the serial cable, and replace the shipping plug in the serial port.



**Caution:** The serial port is intended only for use during the initial setting of the IP address and for service purposes. HP does not recommend using the serial port during normal switch operation or for regular maintenance.

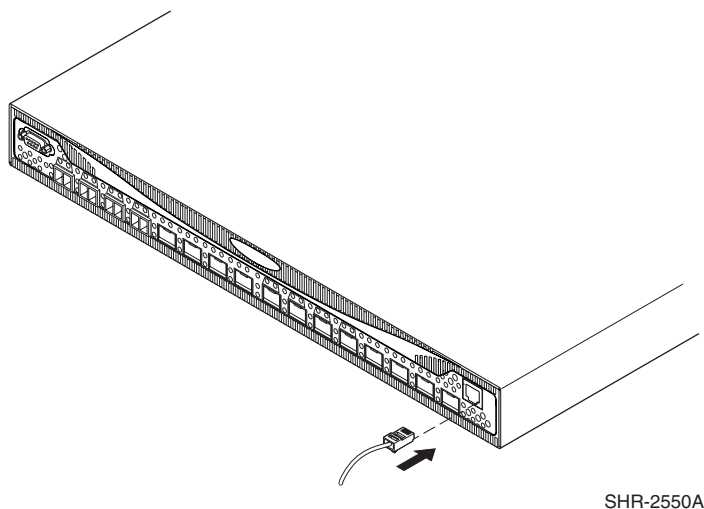
---

- 8. Record the IP address on the label affixed to the switch.

## Connecting the Switch to the LAN

Execute the following procedure to connect the switch to the Ethernet Local Area Network (LAN) segment.

1. Remove the shipping plug from the Ethernet port.
2. Connect one end of an Ethernet cable to the Ethernet port, see [Figure 15](#).



**Figure 15: Connecting the Ethernet cable**

3. Connect the other end of the Ethernet cable to the workstation or to an Ethernet network containing the workstation.

---

**Note:** You can now access the switch remotely (and from multiple connections), using Telnet or the Web Tools application. Verify that the switch is not accessed from any other connections during the remaining steps.

---

4. Log in to the switch with administrator privileges by Telnet. The default administrator logon is `admin` and the default password is `password`.

## Important Information on Setting the Core PID Format

The switch may require a change to the configuration setting known as the Core PID format.

A Core PID format is one of two addressing mechanisms used in Fibre Channel. The PID format is analogous to specifying the physical switch and port a device is attached to in data networks. It is not analogous to an IP address. PID formats are assigned by a Fibre Channel switch when a device logs into the fabric.

A typical Core PID might look like this:

011F00

In new installations, where both edge and the Core Switch 2/64 reside, you must verify that the edge switch (for example, SAN Switch 2/16) Core PID format matches the Core switch's PID format (always 1), before connecting to the SAN. If a switch is introduced to an existing SAN with a Core PID format setting that differs from the Core PID format setting in the SAN, the switch *segments*.

---

**Note:** If you are in the process of creating a new SAN, set the PID format to 1, if possible.

---

## How to Check the Current Core PID Format

To determine a switch's current Core PID format, connect directly to a switch in your SAN and complete the following steps via a Telnet session, or the Serial cable supplied with the switch.

1. Issue the `configShow` command and press **Enter**.
2. About 15 lines down (press **Enter** to display more information on the page), locate the following line:

```
fabric.ops.mode.pidFormat: [1 or 0]
```

---

**Note:** In the preceding example, the Core PID format is 1 or 0, depending on the number displayed in the brackets.

---

## How to Change the Core PID Format

For the switches to interoperate properly, all of them must have the same Core PID format. Execute the following procedure to change the Core PID format, if necessary.



**Caution:** Remember that you must change the Core PID format before connecting fiber cables.

1. If the switch is configured for zoning, issue the `cfgDisable` command to disable zoning.
2. To disable the switch, issue the `SwitchDisable` command and press **Enter**.
3. Issue the `configure` command and press **Enter**. The following prompt displays:  
Configure...
4. Enter `y` at the Fabric parameters prompt:  
Fabric parameters (yes, y, no, n): [no] y
5. Locate the line, Core Switch PID Format: (0..1). Enter either 0 or 1 to match the SAN's existing PID format.
6. Continue to press **Enter** until you have completed the configure section and returned to the admin prompt.
7. Issue the `SwitchEnable` command and press **Enter**.
8. After setting the PID Format to match the other switches in the fabric, go to the “[Connecting the Switch to the LAN](#)” section on page 43 for instructions on connecting Fibre Channel cables.
9. If necessary, issue the `cfgEnable` command to reestablish zoning.

**Note:** After the switch PID format is set, it is stored in the flash memory of the switch; it is not necessary to set it again during subsequent firmware upgrades.

## Modifying Domain IDs

As an option, modify the domain IDs, if desired, as follows.

---

**Note:** The default domain ID is 1. If the default domain ID is already in use when the switch is connected to the fabric, the domain ID for the new switch is automatically reset to a unique value. The domain IDs that are currently in use can be determined using the Telnet command `fabricShow`.

---

1. Disable the switch by issuing the `switchDisable` command:
2. Issue the `configure` command.
3. Enter `y` after the `Fabric parameters` prompt.  
`Fabric parameters (y, n)`
4. Enter a unique domain ID (such as the domain ID used by the previous switch, if still available).  
`Domain: (1..239) [1] 3`
5. Complete the remaining prompts (or press **CTRL+D** to accept the remaining settings without completing all the prompts).
6. Reenable the switch by issuing the `switchEnable` command.

## Specifying Custom Status Policies

As an option, if desired, specify any custom status policies for the fabric as follows.

1. Issue the `switchStatusPolicySet` command at the prompt.
2. Specify the desired status policies. To completely deactivate the alarm for a particular condition, enter 0 at the prompt for that condition.

---

**Note:** Configure each port to match the topology of each host or target before connecting to the device. The default port configuration is fabric, not private loop. The switch does not auto-sense topology.

---

## Connecting the Switch to the Fabric

Follow this procedure to connect the SFPs and cables to switch ports as required.

---

**Note:** The ports and cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the *HP StorageWorks ISL Trunking Version 3.1.x/4.1.x User Guide*.

---

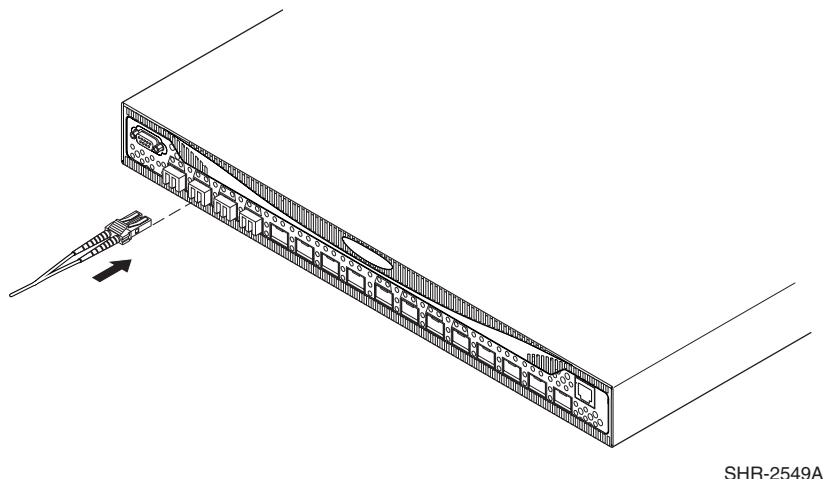
1. Remove the shipping plug from the appropriate ports.
2. Position the SFP so that the key (the tab near the cable-end of the SFP) is on top.
3. Insert the SFP into the port until it is firmly seated and the latching mechanism clicks.

---

**Note:** The SFP is keyed so that it can be inserted only into the port with the correct orientation. If the SFP does not slide in easily, check the orientation.

---

4. Connect the cables to the SFPs as appropriate to the fabric topology by positioning each cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the SFP, see [Figure 16](#).



**Figure 16: Inserting a cable into an SFP**

---

**Note:** The cable is keyed so that it can only be inserted correctly into the SFP. If the cable does not slide in easily, check the orientation.

---

## Verifying Operation

After making the appropriate connections, as outlined in this chapter, follow these steps to verify that the switch is running properly.

1. Access your browser.
2. At the URL address window, enter:  
`http://your switch IP address`
3. If connected properly, the name of your switch appears (in green) at the prompt, indicating Healthy/OK.



---

**Note:** HP strongly recommends that you back up the configuration. This ensures that a complete configuration is available if required for a replacement switch. For instructions on how to back up the configuration, refer to “[Backing Up System Configuration Settings](#)” in Chapter 4.

---

## Installing Multiple Switches into an Existing SAN

Follow this procedure to set up more than one edge switch in an existing SAN.

1. Connect the appropriate components as shown in the installation section of this chapter.
2. Connect the power cord to the AC connector on the switch. The switch performs POST.
  - If a malfunction occurs during POST, error messages are written to the switch error log and can be viewed by a Telnet or terminal session when the POST session completes.
  - If the malfunction prohibits the switch from completing the boot process (a fatal error), the switch stops the boot process. If the switch does not fully boot, the switch prompt is not displayed when the serial port is connected.
3. Connect the serial cable, provided in the package contents, between a host computer and the serial port of the switch. See the “[Setting Network Addresses via a Serial Connection](#)” on page 40, to make a serial connection through a workstation and to set the IP address.

4. Set the switch Domain Address (by issuing the `configure` command) to the next unused domain in the SAN. The default domain setting is 1.

---

**Note:** If a switch boot failure occurs, the switch must be taken offline for repair or replacement. Contact your HP Technical Support for assistance.

---

5. Power off the new switch and connect one Fibre Channel cable from the SAN to the new switch.

## Next Steps

Specific tasks remain to be completed before the switch is fully operational and manageable with the equipment in your network. These tasks and the associated tools are described in the remaining documents shipped with the product on the documentation CD-ROM.

## Setting QuickLoop Mode on Ports

The default configuration for a port is fabric mode. QuickLoop is used to connect private hosts to private storage using the Fibre Channel network. A QuickLoop zone, connecting two switches, may be used to expand the number of private hosts and storage connected. An entire switch can be set to operate in QuickLoop mode using the `qlEnable` Telnet command. A port on a switch operating in mixed mode can be set to or removed from QuickLoop using the Telnet commands `qlPortEnable` and `qlPortDisable`. Refer to the *HP StorageWorks QuickLoop Fabric Assist Version 3.1.x/4.1.x User Guide* for more details.

## Setting Up Speed Negotiation

The switch ports can operate at three different speed levels: auto-sensing mode, 1 Gbps mode, or 2 Gbps mode. Use the Telnet command `switchCfgSpeed` to set the speed level for all ports in a switch. Use the `portCfgSpeed` to set the speed level for a single port. Depending on your environment, you may need to force a port to use a specific speed level. Auto negotiation may not be supported by the

device. Check the configuration information for your network components for specific requirements. See the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Procedures User Guide* for a detailed command description.

## Cascading Switches

The Domain ID number uniquely identifies a switch in a fabric. Normally, the switch automatically assigns the Domain ID when the switch is first powered on or when the switch disable or enable command is executed. When two switches are cascaded together, there might be an initial Domain ID conflict, if the switches had been assigned the same Domain ID prior to being cascaded. This conflict can be avoided by changing the Domain ID with the `configure` command.

The Domain address may change when disabling and enabling one of the switches or rebooting one of the switches, if the Domain is not set using the `configure` command.

Switch parameters for all switches in a SAN must be the same, or the switch may not join the SAN.



# Managing the SAN Switch 2/16

## 3

This chapter discusses the following topics:

- [Interpreting LED Activity](#), page 54
- [Management Overview](#), page 60
- [Running Basic Switch Operations Using Telnet](#), page 61
- [Diagnostic Tests](#), page 65

## Interpreting LED Activity

SAN Switch 2/16 status is determined through LED activity. The LEDs flash green, yellow, or orange while the switch is booting and while POST or other diagnostic tests are running. This is normal and does not indicate a problem.

---

**Note:** Any errors related to LED activity are listed in the error log. For information about the error log, refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Procedures Guide*.

---

## Front Panel LEDs

The front panel includes the following LEDs:

- One Switch Power LED on the front panel
- One Port Status LED above and to the left of each of the 16 ports
- One Port Speed LED above and to the left of each of the 16 ports

[Table 5](#) describes front panel LEDs and their functionality.

**Table 5: Front Panel LED Patterns During Normal Operation**

LED	LED Location	Color Display	Hardware Status	Recommended Action
Port Status LED	Above each port, on left	No light	No light or signal carrier (media or cable) is detected.	Check media and cable.
		Steady green	Port is online (connected to an external device) but has no traffic.	No action required.
		Slow-flashing green	The port is online but segmented, indicating a loopback cable or incompatible switch.	Verify correct device is connected to port.
		Fast-flashing green	The port is in internal loopback (diagnostic).	No action required.
		Flickering green	Port is online, with traffic flowing through port.	No action required.
		Flashing or steady yellow	POST is running.	No action required.
		Steady orange	Port is receiving light or signal carrier, but is not yet online.	No action required.
		Slow-flashing orange	The port is disabled (result of diagnostics or portDisable command).	Reset the switch from a management station.

**Table 5: Front Panel LED Patterns During Normal Operation (Continued)**

LED	LED Location	Color Display	Hardware Status	Recommended Action
Port Status LED (continued)		Fast-flashing orange	The port is faulty.	Reset the switch from a management station.
		Alternating green and yellow	Port is bypassed.	Reset the port from a management station.
Port Speed LED	Above each port, on right	No light	The port is transmitting/receiving at 1 Gbps.	No action required.
		Steady green	The port is transmitting/receiving at 2 Gbps.	No action required.



**Table 5: Front Panel LED Patterns During Normal Operation (Continued)**

LED	LED Location	Color Display	Hardware Status	Recommended Action
Power Switch LED	Below Serial port	No light	Either the switch is off, or boot is not complete, or boot has failed.	Verify that the switch is on and boot has had time to complete. If there is still no light, contact the switch supplier.
		Steady green	Switch is on and boot has successfully completed.	No action required.
		Slow-flashing green	Diagnostic failure on one or more ports.	Errors may be listed in the error log. Refer to the <i>HP StorageWorks Fabric OS Version 3.1.x/4.1.x Procedures Guide</i> for more information.

## Rear Panel LEDs

The rear panel includes the following LEDs:

- One power supply LED for each power supply
- One Port Readiness LED

Table 6 describes the LEDs on the rear panel of the switch.

**Table 6: Rear Panel LED Patterns During Normal Operation**

LED	LED Location	Color Display	Hardware Status	Recommended Action
Power Supply LED	On each power supply	No light	Power supply is not providing power.	Verify power supply is on and power cable is connected to a valid power source.
		Steady green	Power supply is providing power.	No action required.
Port Status LED	Center of Back Panel	No Light	Either the switch is off, or boot is not complete, or boot has failed.	Verify that the switch is on and boot had time to complete. If there is still no light, contact the switch supplier.

**Table 6: Rear Panel LED Patterns During Normal Operation (Continued)**

LED	LED Location	Color Display	Hardware Status	Recommended Action
Port Status LED (continued)		Steady green	Switch is on and boot has successfully completed.	No action required.
		Steady yellow	Diagnostic command is in progress, or one or more ports are faulty.	If no diagnostic tests are running, check the Port Status LEDs for fault indicators.
		Slow-flashing yellow	Diagnostic failure on one or more ports.	Errors may be listed in the error log. Refer to the <i>HP StorageWorks Fabric OS Version 3.1.x/4.1.x Procedures Guide</i> for more information.

## Management Overview

The switch is managed using TCP/IP protocol, in-band over Fibre Channel, or out-of-band by connecting to the Ethernet port. The management functions allow the administrator to monitor fabric topology, port status, physical status, and other information to aid in system debugging and performance analysis.

The switch is compatible with the following management interfaces:

- Command Line Interface (CLI) via a Telnet connection — For more information refer to the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Procedures Guide* and the *HP StorageWorks Fabric OS Version 3.1.x/4.1.x Reference Guide*.
- Standard SNMP applications — For more information refer to the *HP StorageWorks Version 3.1.x/4.1.x Management Information Base Reference Guide*.
- Web Tools — Provides an easy-to-use Graphical User Interface (GUI), allowing the SAN administrator to monitor and manage entire fabrics and individual switches and ports from a standard workstation. Web Tools provides you with the advantage of being virtually in front of any fabric, switch, or port. For more information refer to the *HP StorageWorks Web Tools Version 3.1.x/4.1.x User Guide*.

## Optional Management Features

Refer to the *HP StorageWorks SAN Switch 2/16 Version 3.1.x Release Notes* for a complete list of management features enabled on the switch.

## Displaying the Optional Feature Licenses

Use these steps to display optional features installed on your switch.

1. Log in to the switch as the admin user.
2. At the command line, issue the `licenseShow` command.

This command displays the license keys that have been entered for the switch and the features enabled by those licenses.

## Enabling Licensed Features

Licensed features such as QuickLoop and Fabric Watch are already loaded onto the switch firmware, but must be enabled with a license key. Once you have purchased these features you are provided with a key to unlock the feature.

Use these steps to enable a licensed feature.

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

```
licenseAdd aaaBbbCcc
```

(where *aaaBbbCcc* is the license key for a particular feature.)

---

**Note:** You must enter a license key for each feature to activate. License keys are case sensitive.

---

## Running Basic Switch Operations Using Telnet

Read the following sections to run common switch operations.

### Logging in to the Switch

Follow this procedure to log in to the switch.

1. Open a Telnet connection to the switch. The login prompt displays if the Telnet connection successfully finds the switch in the network.

---

**Note:** The switch must be connected to your IP network through the RS-232 port to enable connection through telnet.

---

2. At the login prompt, enter the user ID you are logging in as. For example:

```
login: admin
```

The password prompt is displayed if the user exists.

3. Enter the password for the user:

password: xxxxxx

The default password is password.

4. If the login is successful, a prompt displays showing the switch name and user ID you are logged in as. For example:

switch55>admin:

## Changing the Admin Password and User ID

Use these steps to change the admin user ID and password.

---

**Note:** For security reasons, the first time you log in to the Fabric OS you are requested to change the admin user ID and system password.

---

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:  

```
Password admin
```

An interactive session is opened and you are prompted for configuration values.
3. At the `New Username` prompt, enter a new name for the admin user. You can change the name of the admin user without changing the password. Press **Enter** to leave the name as is.
4. At the `Old Password` prompt, enter the old password.
5. At the `New Password` prompt, enter the new password. The new password must be between 8 to 40 characters.
6. At the `New Password` prompt, enter the new password exactly as entered to the previous prompt.
7. Press **Enter** to commit the configuration to the firmware.

## Configuring the IP and Fibre Channel Address

The SAN Switch 2/16 is shipped with a default IP address of 10.77.77.77. Use these steps to change the default IP address and configure the Fibre Channel IP address of the switch.

1. Log in to the switch as the admin user.
2. At the command line, issue the `ipAddrSet` command.  
An interactive session opens and you are prompted for configuration values. Press **Enter** to skip a prompt and leave the parameter value as is.
3. At the Ethernet IP Address prompt, enter the new IP address for the Ethernet port on the switch. Press the **Enter** to continue.
4. At the Ethernet Subnetmask prompt, enter the address of the subnetmask, if applicable. Press **Enter** to continue.
5. At the Fibre Channel IP address prompt, enter the Fibre Channel IP address for the switch. Press **Enter** to continue.
6. At the Fibre Channel Subnetmask prompt, enter the address of the subnetmask, if applicable. Press **Enter** to continue.
7. At the Gateway Address prompt, enter the IP address of the gateway system if applicable. Press **Enter** to continue.  
The configuration is then committed to the switch firmware.
8. You are then prompted either to make the IP address changes active now or at the next reboot. Enter `y` at the prompt to have the IP address changes take effect immediately.

## Displaying Devices within the Fabric

To verify that you have fabric-wide connectivity when you install a new switch, display the fabric-wide device count from the newly installed switch. Use these steps to display the fabric.

1. Log in to the switch as the admin user.
2. At the command line, issue the `nsAllShow` command.  
This command displays all the connected devices in the fabric.

## Checking the Firmware Version

Use these steps to display the firmware version.

1. Log in to the switch as the admin user.
2. At the command line, issue the `version` command.

This command displays the Kernel version, and Fabric OS release number.

## Setting the Switch Date and Time

All switches maintain current date and time in non-volatile memory. Date and time are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly.

Execute the following procedure to set the date and time of a switch.

1. Log in to the switch as the admin user.
2. At the command line, issue the following command:

```
date "MMDDhhmmYY"
```

where:

- MM is the month, valid values are 01–12.
- DD is the date, valid values are 01–31.
- hh is the hour, valid values are 00–23.
- mm is minutes, valid values are 00–59.
- YY is the year, valid values are 00–99.

---

**Note:** Year values greater than 69 are interpreted as 1970–1999; year values less than 70 are interpreted as 2000–2069. The date function does not support daylight saving time or time zones.

---

## Displaying Switch Configuration Settings

Follow these steps to display the system configuration settings.

1. Log in to the switch as the admin user.
2. At the command line, issue the `configShow` command.

The system configuration settings are displayed.



## Diagnostic Tests

This section contains information on using POST and diagnostic tests.

### Interpreting POST Results

Each time the switch is powered on or reset, the it automatically performs POST, a one minute system check during which the port status LEDs flash different colors.

To determine whether POST completed without errors, verify that all LEDs return to a normal state after POST is complete. If one or more LEDs do not return to a normal state, and this is not due to the switch being set to beacon, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

---

**Note:** If the switch prompt does not display when POST completes, POST did not successfully complete and the switch should be returned to your switch supplier for repair.

---

Any errors detected during POST are written to the system log, accessible through the `errShow` command. For more information about error messages, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

### Diagnostic Tests

Diagnostic tests are provided to help troubleshoot the hardware and the firmware. The diagnostic tests provided on the switch include tests of internal connections and circuitry, fixed media, and any SFP modules and fiber optic cables in use. The tests are implemented by command, either through a Telnet session or through a terminal set up for a serial connection to the switch. Some tests require the ports to be connected by external cables, to allow diagnostics to verify the serializer/deserializer interface, as well as the attached SFP and cable.

All diagnostic tests are run at link speeds of both 1 Gbps and 2 Gbps. For information about the specific diagnostic tests and how to run them, refer to the *HP StorageWorks Fabric OS Procedures Version 3.1.x/4.1.x User Guide*.

---

**Note:** The transmit and receive speed of the links may be temporarily locked to a specific speed during diagnostic testing.

---



# Backing Up the Configuration and Upgrading Firmware

## 4

This chapter discusses the following topics:

- [Backing Up System Configuration Settings](#), page 68
- [Upgrading or Restoring the Switch Firmware](#), page 69
- [Downloading Firmware from the HP Website](#), page 70

## Backing Up System Configuration Settings

HP strongly recommends saving the configuration after the initial configuration changes and periodically thereafter.

FTP must be used on Windows workstations to back up the system configuration. The FTP server must be running before an upload can occur. Use the RSHD service or FTP on a UNIX machine.

---

**Note:** The two supplied utilities, RSHD.EXE and CAT.EXE, currently do not support uploads for Windows, only downloads. These utilities are available from the support website: <http://www.hp.com/support/>

---

Follow these steps to upload a backup copy of the configuration settings to a host computer:

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or UNIX machine) is running on the host workstation.
2. Log in to the switch as the admin user.
3. At the command line issue the following command:

```
configUpload hostIPAddr user path_filename password
```

Where *hostIPAddr* is the IP address of the host computer, *user* is the User ID used to log into this computer, *path\_filename* is the path location and filename of the configuration file, and *password* is the password for the user ID specified.

If only `configupload` is entered, the system prompts you for each parameter, as follows:

```
switch:admin> configupload
Server Name or IP Address [host]: 123.45.678.901
User Name [user]: kelev
File Name [config.txt]: switch1
Protocol (RSHD or FTP) [rshd]: ftp
Password:
upload complete
```

## Restoring the System Configuration Settings

Follow these steps to restore the system configuration settings from a backup:

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or UNIX machine) is running on the host workstation.
2. Log in to the switch as the admin user.
3. Shut down the switch by issuing the `switchDisable` command.
4. At the command line, issue the following command:

```
configDownload "hostIPAddr", "user", "path_filename", "password"
```

Where `hostIPAddr` is the IP address of the host computer, `user` is the user ID used to log in to this computer, `path_filename` is the path location and filename of the system configuration file, and `password` is the password for the user ID specified.

---

**Note:** The password operand is required only if you are using FTP.

---

5. Reboot the switch by issuing the `fastBoot` command.

## Upgrading or Restoring the Switch Firmware

The SAN Switch 2/16 ships with preloaded firmware. In most cases, there is no need to update the firmware on the new switch. The firmware version can be determined by:

- The `version` command via Telnet
- The Switch Management Application page in Web Tools

Follow these steps to upgrade or restore the switch firmware:

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or UNIX machine) is running on the host workstation.
2. Log in to the switch as the admin user.
3. At the command line, issue the following command:

```
firmwareDownload hostIPAddr, user, path_filename, password
```

Where *hostIPaddr* is the IP address of the host computer, *user* is the user ID used to log in to this computer, *path\_filename* is the path location and *filename* of the new firmware file, and *password* is the password for the user ID specified.

---

**Note:** The password operand is required only if you are using FTP.

---

4. Reboot the switch by issuing the `fastBoot` command.

## Downloading Firmware from the HP Website

To download the firmware from the HP website, go to <http://www.hp.com>.

The website contains the required loaders and instructions for downloading the firmware to a switch.

# Regulatory Compliance Notices



## FCC EMC Statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

## EMC Statement (Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

## EMC Statement (European Union)

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

## Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

## Germany Noise Declaration

Schalldruckpegel  $L_p = 46.1 \text{ dB(A)}$  Am Arbeitsplatz (operator position) Normaler Betrieb (normal operation) Nach ISO 7779:1999 (Typprüfung)

## VCCI EMC Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。



## Harmonics Conformance (Japan)

高調波ガイドライン適合品

## BSMI EMC Statement (Taiwan)

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

## RRL EMC Statement (Korea)

사용자 안내문 : A 급기기

이기는 업무용으로 전자파 적합등록을 받은 기기 이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

## Laser Safety

### A. Certification and Classification Information

When equipped with native Fibre Channel adapters, this product contains a laser internal to the small form factor pluggable (SFP) transceiver modules.

In the USA, the SFP module is certified as a Class 1 Laser product, conforming to the requirements contained in Department Of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the metal SFP housing.

Outside the USA, the SFP is certified as a Class 1 Laser product conforming to requirements contained in IEC 825-1:1993 and EN60825-1:1994, including Amendment 11:1996.

The SFP includes the following certifications:

- UL Recognized Component (USA)
- CSA Certified Component (Canada)
- TUV Certified Component (European Union)
- CB Certificate (Worldwide)

The following figure shows the Class 1 information label that appears on the metal housing of the SFP.

CLASS 1 LASER PRODUCT 21 CFR(J)

### B. Product Information

Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of either 850 nanometers (shortwave laser) or 1310 nanometers (longwave laser).

Class 1 Laser products are not considered hazardous.

### C. Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.

## Battery Replacement Notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized service provider using the HP spare designated for this product. For more information about battery replacement or proper disposal, contact your HP authorized reseller or your authorized service provider.



**WARNING:** Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

---

Batteries, battery packs, and accumulators should not be disposed of with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, your authorized HP partners, or their agents.



# Electrostatic Discharge

## B

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

## Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm  $\pm$  10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

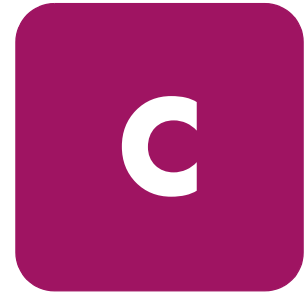
If you do not have any of the suggested equipment for proper grounding, have an HP authorized reseller install the part.

---

**Note:** For more information on static electricity, or for assistance with product installation, contact your HP authorized reseller.

---

# Technical Specifications



This appendix discusses the following topics:

- [Dimensions](#), page 80
- [Power Supply Specifications](#), page 81
- [Environmental Requirements](#), page 82
- [Memory Specifications](#), page 83

## Dimensions

[Table 7](#) lists SAN Switch 2/16 dimensions.

**Table 7: Physical Specifications**

Dimension	Value
Height	1.72 +/- 0.01 inches (4.37 +/- 0.03 cm)
Depth	24.5 +/- 0.03 inches (62.2 +/- 0.1 cm)
Width	17 inches (43.2 cm)
Weight (with both power supplies)	28.0 lbs (12.7 kg)



## Power Supply Specifications

[Table 8](#) lists power supply specifications. The power supply is universal and capable of functioning worldwide without using voltage jumpers or switches. It meets IEC 61000-4-5 surge voltage requirements. The power supply has its own built-in fan for cooling, pushing the air towards the front of the switch.

**Table 8: Power Supply Specifications**

Specification	Value
Outlet	Correctly wired and earth-grounded
Total power available from each power supply	126 Watts, with fans operating
Max. switch power	90 - 102 Watts (depending on SFP media vendor)
Input voltage	100 - 240 VAC
Input line frequency	47 - 63 Hz
Harmonic distortion	Active power factor correction per IEC1000-3-2
BTU rating	170 Watts x 3.412 BTU/Hr/Watts = 580 BTU/hr
Inrush current	10 Amps Peak, > 300 $\mu$ sec - hot/cold start
Input line protection	Fused in both hot & neutral lines

## Environmental Requirements

Table 9 lists the environmental ranges that are acceptable when the switch is operating, and the acceptable ranges when the switch is not operating.

**Table 9: Environmental Requirements**

Condition	Acceptable Range
Temperature (operating)	10°C to 40°C
Temperature (non-operating)	-35°C to 65°C
Humidity (operating)	20% to 85% RH non condensing, at 40°C
Humidity (non-operating)	0% to 90% RH non-conducting, at 40°C
Altitude (operating)	0 to 3 kilometers above sea level
Altitude (non-operating)	0 to 12 kilometers above sea level
Shock (operating)	4G, 11MS duration, half sine
Shock (non-operating)	20G, 11MS duration, sq.wave
Vibration (operating)	5G, 0-3 kHz at 1.0 octave/minute
Vibration (non-operating)	10G, 0-5kHz at 1.0 octave/minute

## Memory Specifications

The switch utilizes the following memory.

- Main Memory (SDRAM): 32 MB per switch
- Flash Memory: Dual 8 MB
- Boot Flash: 512K bytes of 8-bit for system boot

The centralized memory maximizes the overall switch throughput by guaranteeing full transmit and receive bandwidth to all Fibre Channel ports at all times.

---

**Note:** For dust and ESD (electrostatic discharge) protection, a cover is provided for the Serial port and should be kept on the port whenever the Serial port is not in use.

---

The Serial port can be used to connect to a computer workstation to configure the switch IP address without connecting to the fabric. The Serial port's parameters are 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.

The port requires a straight Serial cable with a female 9-pin subminiature-D connector. Only pins 2, 3, and 5 are supported; if pin 7 is used, the signal must always be driven high, using the pinouts listed in [Table 10](#).

**Table 10: Cabling Pinouts if Pin 7 is Used**

PIN	Signal	Description
1		
2	TxData	Transmit Data
3	RxData	Receive Data
4		
5	GND	Logic Ground
6		
7	CTS	Clear to Send
8		
9		



## glossary

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

### **AL\_PA**

Arbitrated Loop Physical Address; a unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

### **Alias Address Identifier**

An address identifier recognized by a port in addition to its standard identifier. An alias address identifier may be shared by multiple ports.

### **Alias AL\_PA**

An AL\_PA value recognized by an L\_Port in addition to the AL\_PA assigned to the port.

### **Alias Server**

A fabric software facility that supports multicast group management.

### **API**

Application Programming Interface; defined protocol that allows applications to interface with a set of services.

### **Arbitrated Loop**

A shared 100 MBps or 200 MBps Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment. See also *Topology*.

### **ASIC**

Application Specific Integrated Circuit.

### **ATM**

Asynchronous Transfer Mode; a transport used for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity, and allows nodes to transmit simultaneously.

### **AW\_TOV**

Arbitration Wait Time-out Value; the minimum time an arbitrating L\_Port waits for a response before beginning loop initialization.

**Bandwidth**

The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a network. See also *Throughput*.

**BB\_Credit**

Buffer-to-buffer credit; the number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by the number of receive buffers available.

**BER**

Bit Error Rate; the rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *Error*.

**Block**

As applies to Fibre Channel, upper-level application data that is transferred in a single sequence.

**Bridge**

Hardware that connects incompatible networks by providing translation for both hardware and software. For example, an ATM gateway can connect a Fibre Channel link to an ATM connection.

**Broadcast**

The transmission of data from a single source to all devices in the fabric, regardless of zoning.

**Buffer-to-buffer Flow Control**

Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB\_Credit*.

**Cascade**

Two or more interconnected Fibre Channel switches. The recommended number of interswitch links is seven. See also *Fabric*, *ISL*.

**Chassis**

The metal frame in which the switch and switch components are mounted.

**Circuit**

An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *Link*.

**Command Line**

Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

**Community (SNMP)**

A relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined. See also *SNMP*.

**Connection Initiator**

A port that has originated a Class 1 dedicated connection and received a response from the recipient.

**Connection Recipient**

A port that has received a Class 1 dedicated connection request and transmitted a response to the originator.

**CRC**

Cyclic Redundancy Check; a check for transmission errors included in every data frame.

**Credit**

As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also *BB\_Credit*, *EE\_Credit*.

**Disparity**

The relationship of ones and zeros in an encoded character. “Neutral disparity” means an equal number of each, “positive disparity” means a majority of ones, and “negative disparity” means a majority of zeros.

**DLS**

Dynamic Load Sharing; dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx\_Port or E\_Port changes status.

**Domain ID**

As applies to SAN switches, a unique number between 1 and 239 that identifies the switch to the fabric and is used in routing frames. Usually automatically assigned by the switch, but can be manually assigned.

**E\_D\_TOV**

Error Detect Time-out Value; the minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

**E\_Port**

Expansion Port; a type of switch port that can be connected to an E\_Port on another switch to create an ISL. See also *ISL*.

**EE\_Credit**

End-to-end Credit; the number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination. See also *End-to-end Flow Control*, *BB\_Credit*.

**EIA Rack**

A storage rack that meets the standards set by the Electronics Industry Association.

**Enabled Zone Configuration**

The currently enabled configuration of zones. Only one configuration can be enabled at a time.

**End-to-end Flow Control**

Governs flow of class 1 and 2 frames between N\_Ports. See also *EE\_Credit*.

**Error**

As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

**Exchange**

The highest level Fibre Channel mechanism used for communication between N\_Ports. Composed of one or more related sequences, and can work in either one or both directions.

**F\_Port**

Fabric Port; a port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N\_Port to a switch.

**Fabric Name**

The unique identifier assigned to a fabric and communicated during login and port discovery.

**Fabric**

A Fibre Channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric. See also *Topology*, *SAN*, *Cascade*.

**FC-AL-3**

The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

**FC-FLA**

The Fibre Channel Fabric Loop Attach standard defined by ANSI.

**FCIA**

Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards.

**FCP**

Fibre Channel Protocol; mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

**Fibre Channel Transport**

A protocol service that supports communication between Fibre Channel service providers.



**FL\_Port**

Fabric Loop Port; a port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL\_Port to a switch.

**FLOGI**

Fabric Login; the process by which an N\_Port determines whether a fabric is present, and if so, exchanges service parameters with it.

**Frame**

The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: Link control frames (transmission acknowledgements, etc.) and data frames.

**FS\_ACC**

Fibre Channel Services Accept. The information unit used to indicate acceptance of a request for a Fibre Channel service.

**FSP**

Fibre Channel Service Protocol; the common protocol for all fabric services, transparent to the fabric type or topology.

**FSPF**

Fabric Shortest Path First; the routing protocol for Fibre Channel switches.

**Full Fabric**

The licensing that allows multiple E\_Ports on a switch, making it possible to create multiple ISL links.

**Full-duplex**

A mode of communication that allows the same port to simultaneously transmit and receive frames.

**Fx\_Port**

A fabric port that can operate as either an F\_Port or FL\_Port.

**G\_Port**

Generic Port; a port that can operate as either an E\_Port or F\_Port. A port is defined as a G\_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

**Gateway**

A device such as a switch that connects different subnets together. A switch can be used as a gateway from the Ethernet to the Fibre Channel. Set the gateway address on one switch to the Fibre Channel IP address of another switch to enable the other switch to forward IP traffic to the Ethernet port on the second switch.

**Gbps**

Gigabits per second (1,062,500,000 bits/second).

**GBps**

GigaBytes per second (1,062,500,000 bytes/second).

**HBA**

Host Bus Adapter; the interface card between a server or workstation bus and the Fibre Channel network.

**Hub**

A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.

**Idle**

Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

**ISL**

Interswitch Link; a Fibre Channel link from the E\_Port of one switch to the E\_Port of another. See also *E\_Port*, *Cascade*.

**Isolated E\_Port**

An E\_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E\_D\_TOVs).

**IU**

Information Unit; a set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

**L\_Port**

Loop Port; a node port (NL\_Port) or fabric port (FL\_Port) that has arbitrated loop capabilities. An L\_Port can be in one of two modes:

- *Fabric mode* Connected to a port that is not loop capable, and using fabric protocol.
- *Loop mode* In an arbitrated loop and using loop protocol. An L\_Port in loop mode can also be in participating mode or non-participating mode.

**Latency**

The period of time required to transmit a frame, from the time it is sent until it arrives.

**Link Services**

A protocol for link-related actions.

**Link**

As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibers.

**LIP**

Loop Initialization Primitive; the signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

**Looplet**

A set of devices connected in a loop to a port that is a member of another loop.

**MIB**

Management Information Base; an SNMP structure to help with device management, providing configuration and device information.

**Monitoring State**

The state in which a port is monitoring the flow of information for data relevant to the port.

**Multicast**

The transmission of data from a single source to multiple specified N\_Ports (as opposed to all the ports on the network).

**Multimode**

A fiber optic cabling specification that allows up to 500 meters between devices.

**N\_Port**

Node Port; a port on a node that can connect to a Fibre Channel port or to another N\_Port in a point-to-point connection.

**NAA**

Network Address Authority. An identifier that indicates the format of a network address.

**Name Server**

Frequently used to indicate Simple Name Server.

**NL\_Port**

Node Loop Port; a node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL\_Port.

**Node Name**

The unique identifier for a node, communicated during login and port discovery.

**Node**

A Fibre Channel device that contains an N\_Port or NL\_Port.

**Open Originator**

The L\_Port that wins arbitration in an arbitrated loop and sends an OPN ordered set to the destination port, then enters the Open state.

**Open Recipient**

The L\_Port that receives the OPN ordered set from the open originator, and then enters the Open state.

**Phantom Address**

An AL\_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL\_PA.

A twenty-bit public address created for an 8-bit loop device to allow public devices to access it.

**Phantom Device**

A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

**PLOGI**

Port Login; the port-to-port login process by which initiators establish sessions with targets.

**Point-to-point**

A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *Topology*.

**Port Cage**

The metal casing extending out of the optical port on the switch, and in which the SFP can be inserted.

**Port\_Name**

The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

**POST**

Power On Self-Test; a series of tests run by a switch after it is turned on.

**Private Device**

A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

**Private Loop**

An arbitrated loop that does not include a participating FL\_Port.

**Private NL\_Port**

An NL\_Port that communicates only with other private NL\_Ports in the same loop and does not log into the fabric.

**Protocol**

A defined method and a set of standards for communication.

**Public NL\_Port**

An NL\_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL\_Ports.

**Public Device**

A device that can log into the fabric and support 20-bit addresses (or has 20-bit phantom addresses created for it by the switch).

**Public Loop**

An arbitrated loop that includes a participating FL\_Port, and may contain both public and private NL\_Ports.

**QuickLoop**

A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop.

May also refer to the arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single AL\_PA space.

**R\_A\_TOV**

Resource Allocation Time-out Value; the maximum time a frame can be delayed in the fabric and still be delivered.

**Route**

As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

**Routing**

The assignment of frames to specific switch ports, according to frame destination.

**RR\_TOV**

Resource Recovery Time-out Value; the minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

**RSCN**

Registered State Change Notification; a switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

**RX\_ID**

Responder Exchange Identifier. A 2-byte field in the frame header used by the responder of the Exchange to identify frames as being part of a particular exchange.

**SAN**

Storage Area Network; a network of systems and storage devices that communicate using Fibre Channel protocols. See also *Fabric*.

**Sequence**

A group of related frames transmitted in the same direction between two N\_Ports.

**Service Rate**

The rate at which an entity can service requests.

**Single Mode**

The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

**SNMP**

Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

**Switch Name**

The arbitrary name assigned to a switch.

**Switch Port**

A port on a switch. Switch ports can be E\_Ports, F\_Ports, or FL\_Ports.

**Switch**

Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

**Target**

A storage device on a Fibre Channel network.

**Tenancy**

The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

**Throughput**

The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

**Topology**

As applies to Fibre Channel, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies:

- Point to point - A direct link between two communication ports.
- Switched fabric - Multiple N\_Ports linked to a switch by F\_Ports.
- Arbitrated loop - Multiple NL\_Ports connected in a loop.

**Transfer State**

The state in which a port can establish circuits with multiple ports without reentering the arbitration cycle for each circuit. This state can only be accessed by an L\_Port in the Open state.

**Translative Mode**

A mode in which private devices can communicate with public devices across the fabric.

**Transmission Character**

A 10-bit character encoded according to the rules of the 8B/10B algorithm.

**Transmission Word**

A group of four transmission characters.

**Trap (SNMP)**

The message sent by an SNMP agent to inform the SNMP management station of a critical error.

**Tunneling**

A technique for enabling two networks to communicate when the source and destination hosts are both on the same type of network, but are connected by a different type of network.

**U\_Port**

Universal Port; a switch port that can operate as a G\_Port, E\_Port, F\_Port, or FL\_Port. A port is defined as a U\_Port when it is not connected or has not yet assumed a specific function in the fabric.

**UDP**

User Datagram Protocol; a protocol that runs on top of IP and provides port multiplexing for upper-level protocols.

**ULP\_TOV**

Upper-level Time-out Value; the minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

**ULP**

Upper-level Protocol; the protocol that runs on top of Fibre Channel. Typical upper-level protocols are SCSI, IP, HIPPI, and IPI.

**Well-known Address**

As pertaining to Fibre Channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

**Workstation**

A computer used to access and manage the fabric. May also be referred to as a management station or host.

**WWN**

Worldwide Name; an identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

**Xmitted Close State**

The state in which an L\_Port cannot send messages, but can retransmit messages within the loop. A port in the XMITTED CLOSE state cannot attempt to arbitrate.

**Zone Configuration**

A specified set of zones. Enabling a configuration enables all zones in that configuration.

**Zone**

A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

**Zoning**

A feature that runs on Fabric OS and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone.



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